Early Journal Content on JSTOR, Free to Anyone in the World

This article is one of nearly 500,000 scholarly works digitized and made freely available to everyone in the world by JSTOR.

Known as the Early Journal Content, this set of works include research articles, news, letters, and other writings published in more than 200 of the oldest leading academic journals. The works date from the mid-seventeenth to the early twentieth centuries.

We encourage people to read and share the Early Journal Content openly and to tell others that this resource exists. People may post this content online or redistribute in any way for non-commercial purposes.

Read more about Early Journal Content at http://about.jstor.org/participate-jstor/individuals/early-journal-content.

JSTOR is a digital library of academic journals, books, and primary source objects. JSTOR helps people discover, use, and build upon a wide range of content through a powerful research and teaching platform, and preserves this content for future generations. JSTOR is part of ITHAKA, a not-for-profit organization that also includes Ithaka S+R and Portico. For more information about JSTOR, please contact support@jstor.org.

(19)—2 times (15) gives,

$$(8a^2b+2ab^2-b^3-6a^3)x^2+(2a^2b^2-8a^3b+2ab^3)x-a^2b^3-4a^3b^2=0 \;\ldots\ldots(20).$$

b times (19)—$(b-4a)$ times (15) gives,

$$(8a^3+b^3-14a^2b)x^2+(ab^3+10a^3b-8a^2b^2)x+8a^3b^2-2a^2b^3=0 \;\ldots\ldots\ldots\ldots(21).$$

$(8a^3+b^3-14a^2b)$ times (20)—$(8a^2b+2ab^2-b^3-6a^3)$ times (21) gives,

$$x=\frac{14a^3b^3+16a^5b+8a^2b^4-28a^4b^2-3ab^5}{4a^5-38a^3b^2+8ab^4+18a^2b^3-3b^5} \;\ldots\ldots\ldots\ldots(22).$$

$(8a-2b)$ times (20)$+(4a+b)$ times (21) gives,

$$x=\frac{10a^3b^2-24a^4b+8a^2b^3-3ab^4}{14a^2b^2+16a^4+8ab^3-28a^3b-3b^4} \;\ldots\ldots\ldots\ldots\ldots(23).$$

From (22) and (23) we get,

$$9b^5+16ab^4-148a^2b^3-144a^3b^2+468a^4b-176a^5=0\ldots\ldots\ldots(24).$$

Let $b/a=v$, then (24) becomes,

$$9v^5+16v^4-148v^3-144v^2+468v-176=0.$$

$\therefore\ v=1.12257.\quad \therefore\ b=1.12257a.\quad \therefore\ a=.8908b.$

The published solution assumes that both curves coincide at their crunodes. This is not what the problem calls for. The above solution realizes in every respect the demands of the problem.

MECHANICS.

Conducted by B. F. FINKEL, Springfield, Mo. All contributions to this department should be sent to him.

SOLUTIONS OF PROBLEMS.

44. Proposed by O. W. ANTHONY, M. Sc., Columbian University, Washington, D. C.

There is a triangle whose sides repulse a center of force within the triangle with an intensity that varies inversely as the distance of the center of force from each point of the sides of the triangle. What is the position of equilibrium of the center?

Solution by G. B. M. ZERR, A. M., Ph. D., Texarkana, Arkansas.

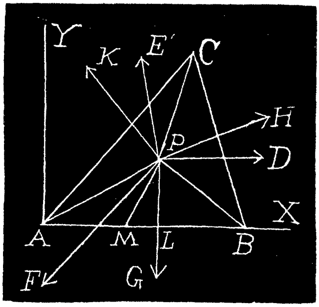
Let $BC=a$, $AC=b$, $AB=c$, $AP=h$, $BP=k$, $CP=l$, $AL=m$, $PL=n$, $\angle APB=\beta$, $\angle BPC=\gamma$, $\angle APC=\delta$.

Then $\beta=\cos^{-1}\left(\dfrac{k^2+h^2-c^2}{2hk}\right)$, $\gamma=\cos^{-1}\left(\dfrac{k^2+l^2-a^2}{2kl}\right)$, $\delta=\cos^{-1}\left(\dfrac{h^2+l^2-b^2}{2hl}\right)$,

$$h^2=m^2+n^2,\ k^2=(c-m)^2+n^2,\ l^2=(b\cos A-m)^2+(b\sin A-n)^2.$$

If P be the required point, A origin, AX, AY, axes, $AM=x$, ρ=density and κ area of cross section of the lines perpendicular to their length, ν=mass of P, μ=some constant, then the attraction on M is,

$$\frac{\mu\nu\rho\kappa dx}{PM}=\frac{\mu\nu\rho\kappa dx}{\{n^2+(m-x)^2\}^{\frac{1}{2}}}.$$



Call $\mu\nu\rho\kappa$, Q. Then the resolved part of the force parallel to axis of X is,

$$\frac{Q(m-x)dx}{n^2+(m-x)^2},$$

and the resolved part parallel to the axis of Y is,

$$\frac{Qndx}{n^2+(m-x)^2}.$$

$$\therefore\ PD=-Q\int_o^c\frac{(m-x)dx}{n^2+(m-x)^2}=\tfrac{1}{2}Q\log\left\{\frac{n^2+(c-m)^2}{n^2+m^2}\right\}.$$

$$\therefore\ PD=Q\log(k/h),\ PE=Q\log(l/k),\ PF=Q\log(h/l).$$

$$PG=-Q\int_o^c\frac{ndx}{n^2+(m-x)^2}=-Q\{\tan^{-1}(m/n)+\tan^{-1}\frac{c-m}{n}\}.$$

$$\therefore\ PG=-Q\beta,\ PH=-Q\gamma,\ PK=-Q\delta.$$

If the resultant of two forces is equal to the third, the three forces are in equilibrium.

Regarding PD, PE, PF as three forces and PG, PH, PK as three forces, we get,

$$\left.\begin{array}{l}\{\log(k/h)\}^2+\{\log(l/k)\}^2+2\log(k/h)\log(l/k)\cos B=\{\log(h/l)\}^2\\ \quad\beta^2+\gamma^2-2\beta\gamma\sin B=\delta^2\end{array}\right\}\ \ldots\ldots\ldots\ldots(1).$$

$$\left.\begin{array}{l}\{\log(l/k)\}^2+\{\log(h/l)\}^2+2\log(l/k)\log(h/l)\cos C=\{\log(k/h)\}^2\\ \qquad\gamma^2+\delta^2-2\gamma\delta\sin C=\beta^2\end{array}\right\}\ldots\ldots\ldots\ldots(2).$$

$$\left.\begin{array}{l}\{\log(h/l)\}^2+\{\log(k/h)\}^2+2\log(h/l)\log(k/h)\cos A=\{\log(l/k)\}^2\\ \qquad\beta^2+\delta^2-2\beta\delta\sin A=\gamma^2\end{array}\right\}\ldots\ldots\ldots\ldots(3).$$

Substituting the values of h, k, l, β, γ, δ in terms of m, n in either (1), (2), or (3), we get, in either case, two equations in m and n from which, if possible, the values of m and n may be found and the point P determined.

◆

PROBLEMS FOR SOLUTION.

ARITHMETIC.

80. **Proposed by CHARLES C. CROSS, Laytonsville, Maryland.**

From a cask containing 10 gallons of wine, a servant drew off 1 gallon each day, for five days, each time supplying the deficiency by adding a gallon of water. Afterwards, fearing detection, he again drew off a gallon a day for five days, adding each time a gallon of wine. How many gallons of water still remained in the cask? [From *Quackenbos' Arithmetic.*]

81. **Proposed by B. F. FINKEL, A. M., M. Sc., Professor of Mathematics and Physics, Drury College, Springfield, Missouri.**

How far will a body fall in the first second on the sun, the density of the sun being 25 times that of the earth and its diameter 866400 miles?

82. **Proposed by CHARLES C. CROSS, Laytonsville, Maryland.**

Two men, A and B, started from the same point at the same time; A traveled southeast for 10 hours and at the rate of 10 miles per hour, and B due south for the same time, going 6 miles per hour; they then turned and traveled directly towards each other at the same rates respectively, till they met. How far did each man travel?

DIOPHANTINE ANALYSIS.

55. **Proposed by O. W. ANTHONY, M. Sc., Professor of Mathematics, Columbian University, Washington, D. C.**

Construct a general Magic Square whose sum is $3m$.

56. **Proposed by G. B. M. ZERR, A. M., Ph. D., Texarkana, Arkansas.**

If $\phi(R)$ is the number of integers which are less than R and prime to it, and if y is prime to R, show that $y^{\phi(R)}-1\equiv0(\text{mod}.R)$.

57. **Proposed by JOSIAH H. DRUMMOND, LL. D., Portland, Maine.**

Each of *five* of the digits may be the terminal figure of a perfect integral square. Each of *eighteen* combinations of two digits may be the *two* terminal figures of an integral square. Each of *one hundred and nineteen* combinations of three digits may be the *three* terminal figures of an integral square. *Under these conditions*, what is the greatest number of arrangements of the nine digits, all taken together, whose three terminal figures shall be those of a square number?